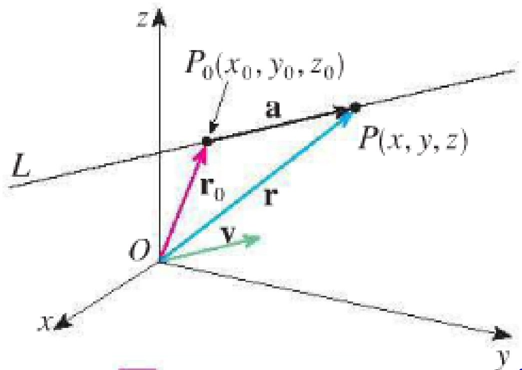


$\bar{r}_0 = \begin{bmatrix} x_0 \\ y_0 \\ z_0 \end{bmatrix}$, $\bar{r} = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$, $\bar{v} = \begin{bmatrix} a \\ b \\ c \end{bmatrix}$

position vec, original pt on ℓ, / position vec, new pt on ℓ / $\parallel$ to ℓ

$\boxed{1}$ $\mathbf{r} = \mathbf{r}_0 + t\mathbf{v}$ vector form of line

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} x_0 \\ y_0 \\ z_0 \end{bmatrix} + t \begin{bmatrix} a \\ b \\ c \end{bmatrix}$$

which, component-wise, is given by the parametric equations for the line.

$x = x_0 + at$

$x - x_0 = at$

$\frac{x - x_0}{a} = t$,

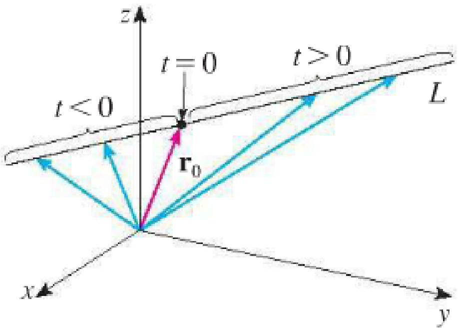
et voila

$\boxed{2}$ $x = x_0 + at \qquad y = y_0 + bt \qquad z = z_0 + ct$

solve each of $\boxed{2}$ for t:

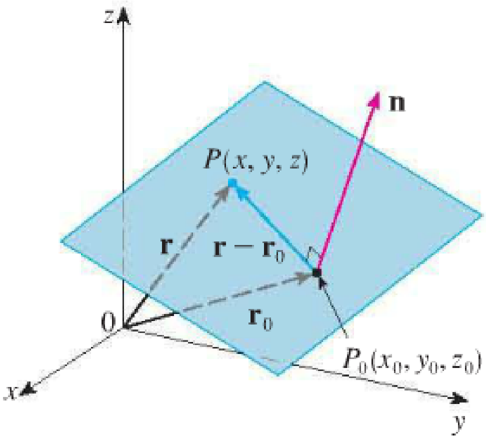
$\boxed{3}$ $$\frac{x - x_0}{a} = \frac{y - y_0}{b} = \frac{z - z_0}{c}$$

$t = t = t$



Navigating to new pts on the line, from $\bar{r}_0$ as starting "position vector."

↳ just thinking about its tip.



Planes

$\begin{bmatrix} x_0 \\ y_0 \\ z_0 \end{bmatrix} = \bar{r}_0$ is an initial point on $\mathcal{P}$. (pos. vec.)

$\begin{bmatrix} x \\ y \\ z \end{bmatrix}$: $\bar{r}$ is an arbitrary pt. on $\mathcal{P}$

$\bar{r} - \bar{r}_0$ is parallel to the plane $\mathcal{P}$

$\begin{bmatrix} a \\ b \\ c \end{bmatrix} = \bar{n}$ is normal to the plane $\mathcal{P}$

Then $\bar{n} \cdot (\bar{r} - \bar{r}_0) = 0$ "Vector Eq'n" for $\mathcal{P}$

Book calls this

others call it "normal form."

$$\bar{n} \cdot (\bar{r} - \bar{r}_0) = 0$$

$$\langle a, b, c \rangle \cdot \langle x - x_0, y - y_0, z - z_0 \rangle = 0$$

$$a(x - x_0) + b(y - y_0) + c(z - z_0) = 0$$

Slick for writing eq'n for plane.

$$ax + by + cz = \underbrace{ax_0 + by_0 + cz_0}_{\text{just a number. call it "d"}} = d$$

$$ax + by + cz = d$$

§12.5 Assignment in about 20 mins.

§12.5 Due Monday.

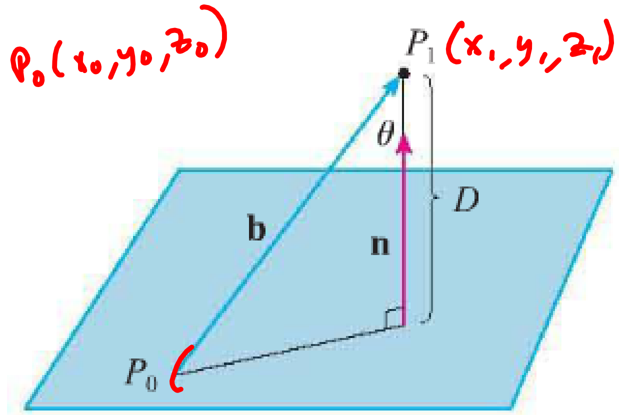


FIGURE 12

$$\overline{b} = \overrightarrow{P_0P_1} = \langle x_1-x_0,\ y_1-y_0,\ z_1-z_0 \rangle$$

$$D = |\text{comp}_{\mathbf{n}}\,\mathbf{b}| = \frac{|\mathbf{n}\cdot\mathbf{b}|}{|\mathbf{n}|}$$

$ax+by+cz=d$ is eq'n of plane.

$$\boxed{\boxed{9} \quad D = \frac{|ax_1 + by_1 + cz_1 + d|}{\sqrt{a^2+b^2+c^2}}}$$

$$\bar{n} = \bar{a} \times \bar{b}$$

$$\bar{d} = \text{proj}_{\bar{n}}\,\bar{c}$$

$$\overrightarrow{P_0P_1} = \bar{c} = \frac{\bar{n}\cdot\bar{c}}{\bar{n}\cdot\bar{n}}\,\bar{n}$$

$$= \left(\frac{(\bar{a}\times\bar{b})\cdot\bar{c}}{(\bar{a}\times\bar{b})\cdot(\bar{a}\times\bar{b})}\right)(\bar{a}\times\bar{b})$$

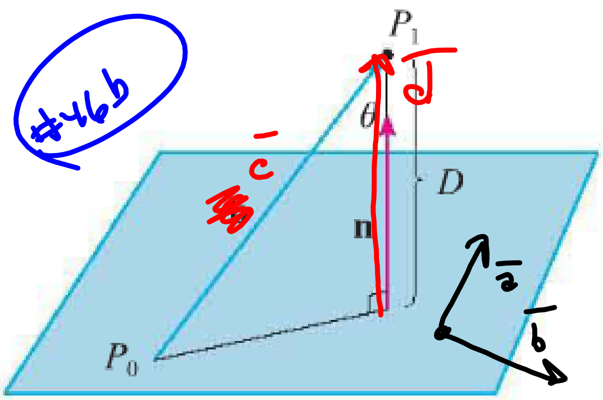


FIGURE 12

we just want its length, D = |mess above|

46b says:

$$\frac{|\bar{a}\cdot(\bar{b}\times\bar{c})|}{|\bar{a}\times\bar{b}|}$$

$$|\text{mess}| = \frac{|\bar{a}\cdot(\bar{b}\times\bar{c})|}{|\bar{a}\times\bar{b}|^2}\cancel{|\bar{a}\times\bar{b}|}$$

Th (5) says

$$= \frac{|\bar{a}\cdot(\bar{b}\times\bar{c})|}{|\bar{a}\times\bar{b}|}$$